2002 WETLAND MITIGATION MONITORING REPORT
FAP 313 (U.S 34) Henderson County

Introduction

This document presents the 2002 wetland and vegetation monitoring results of the constructed wetland compensation for FAP 313 (US 34), Henderson County, Illinois (site location NE/4, NE/4, SW/4, Section 34, T 10 N, R 6 W, Burlington, IA quadrangle). The report follows monitoring guidelines and format set forth in the initial IDOT (Illinois Department of Transportation) monitoring request (Brooks 1999) and in three previously submitted monitoring reports (Cooprider et al. 1999, Cooprider et al. 2000, Wilm et al. 2002).

Originally a wetland (Plocher *et al.* 1995), the site was converted to agriculture before having been left fallow for several years prior to excavation for mitigation purposes in 1997. Reportedly, eight herbaceous wetland species were planted in the wetland portion of the site (*Iris shrevei, Nuphar luteum, Nymphaea odorata, Pontederia cordata, Elodea canadensis, Scirpus tabernaemontanii, Sagittaria latifolia,* and *Potamogeton nodosus*), along with four species of tree seedlings (*Quercus bicolor, Quercus palustris, Carya illinoensis,* and *Carya laciniosa*) planted around much of the perimeter. On-site monitoring was conducted for the fourth consecutive year on July 30, 2002. Planted trees were counted earlier in the year (5 June), in an attempt to avoid the problem of vegetation obscuring the still small trees.

Project goals, objectives, and performance criteria for the wetland compensation site are included in this report, as are monitoring methods, 2002 monitoring results, and summary information. Also addressed, is the likelihood that the compensation site will meet each goal, objective, and performance criteria within the 5-year monitoring period.

Project Goal, Objective, and Performance Standards

The project goal, objective, and performance standards included and evaluated in this report are those identified in the original IDOT tasking order (Brooks 1999) and are as follows:

Project Goal: The created wetland community should be a 10.13 acre (4.1 ha) emergent wetland.

Objective: A high quality marsh will develop through natural re-colonization and planting of obligate wetland species.

Performance Standards:

1. The entire created wetland (10.13 acres) should satisfy the three criteria of the federal wetland definition:

   a) Predominance of hydrophytic vegetation. More than 50% of the dominant plant species must be hydrophytic.

   b) Presence of hydric soils. Hydric soil characteristics should be present, or conditions favorable for hydric soil formation should be present at the site.

   c) Presence of wetland hydrology. The compensation area must be either permanently or periodically inundated at averaged depths less then 2 m (6.6 ft) or have soils that are saturated to the surface for at least 12.5% of the growing season.

2. By the end of the fifth year, a native mean coefficient of conservatism value (native mean C value) of greater than or equal to 3.5 must be achieved, measured over the entire mitigation area. The native mean C value must increase each successive year.

3. By the end of the fifth year, the floristic quality index value (FQI) must be greater than or equal to 20 as measured over the entire mitigation site. The FQI must increase each successive year.

4. By the end of the fifth year, the native mean wetness coefficient (native mean W) must be less than or equal to 0 in the wetland community.

5. The relative importance value of total native plants (RIVn) must increase each successive year.

6. By the end of the fifth year, none of the three most dominant plant species in any of the wetland community zones may be non-native or weedy species, including, but not limited to *Phragmites australis, Poa compressa, Poa pratensis, Lythrum salicaria, Salix interior, Echinochloa crusgalli* or *Phalaris arundinacea,* unless otherwise indicated on the approved mitigation plan.

7. At the end of the five year monitoring period, at least 25% of the created wetland should be covered by hydrophytic vegetation. The interspersion of water and vegetation should be moderate to high. An open body of water surrounded by a continuous band of fringe vegetation is considered to have a low degree of interspersion, while a checkerboard of open water would have a high degree of interspersion.

8. The planned wetland community should be dominated by tall graminoid plants. Woody vegetation should account for less than 30% of the aerial cover.

9. A 75% survival rate shall be maintained each year for all tree species planted within the wetland mitigation site (Department of the Army, Corps of Engineers permit number: CENR-RD-328500).

Methods

Performance Standard 1

a) Predominance of Hydrophytic Vegetation

The method for determining dominant hydrophytic vegetation at a wetland site is described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and further explained in the *Federal Manual for Identifying and Delineating Jursidictional Wetlands* (Federal Interagency Committee for Wetland Delineation 1989). It is based on areal coverage estimates for individual plant species. Each of the dominant plant species is assigned its wetland indicator status rating (Reed 1988). Any plant rated facultative or wetter (i.e., FAC, FAC+, FACW, FACW-, FACW+, and OBL) is considered a hydrophyte. A predominance of vegetation in the wetland plant community exists if more than 50% of the dominant species present are hydrophytic.

b) Occurrence of Hydric Soils

To monitor hydric soil development, soils were sampled in 1999 and verified in 2000, 2001, and 2002. Soil profile morphology, including horizon color, texture, and structure was described at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features were recorded. In the absence of hydric soils indicators, hydrologic data can be used to confirm that conditions favorable for hydric soil formation persist at the site.

c) Presence of Wetland Hydrology

The method for determining the presence of wetland hydrology at a site is described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). Hydrologic indicators may include, but are not limited to, drainage patterns, drift lines, sediment deposits on leaves, watermarks on trees, visual observations of saturated soils, and visual observation of inundation. Monitoring well data from the Illinois State Geological Survey (ISGS) (Fucciolo *et al.* 2002) was also used to determine wetland hydrology.

Performance Standards 2, 3, 6 and 8

Plant Community Quality and Composition

The Floristic Quality Assessment (Swink and Wilhelm 1994, Taft et al. 1997) was utilized to determine the floristic quality and nativity of the plant communities at the site. This method aids in identifying natural areas, monitoring restored and created wetlands, and comparing the quality of vegetation at different sites. First, each plant species native to Illinois is assigned a conservatism coefficient (C) ranging from zero to 10. Individual conservatism coefficients reflect the probability that a particular taxon correlates with anthropogenic disturbances. Plant species assigned zero tend to have low affinities for natural areas and those assigned 10 have very high affinities. A higher quality site will have more species with high conservatism coefficients. When a complete species list is compiled for a site, the mean coefficient value (mCv) and a site Floristic Quality Index can be calculated as follows:

N= the number of native plant species

$MCv = \Sigma C/N$

$FQI = mCv \sqrt{N}$

Sites with FQI values less than 10 indicate low natural quality. Sites with FQI values of 20 or more possess some evidence of natural character and may be considered environmental assets.

Planted Tree Seedling Survival

In the fall of 1999, 500 each of the following four tree species were reportedly planted: *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Carya illinoensis* (pecan), and *Carya laciniosa* (shellbark hickory) (letter from T. Brooks, IDOT, February 2000). All individual live trees were counted while walking the perimeter of the site, where trees were planted.

Performance Standards 4 and 7

Characterization and Extent of Hydrophytic Vegetation

In addition to being assigned a Coefficient of Conservatism, each species is also assigned a mean wetness coefficient based on the National Wetland Category for Region 3 of the U.S. Fish and Wildlife Service (Reed 1998). Plants are designated as obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), or upland (UPL). Plus (+) and minus (-) signs are added when a plant falls between two of the above categories.

For example, FACW+ indicates that a plant is more likely to be found in a wetland than a FACW plant. Likewise, a FACU- suggests that a plant is less likely to be found in a wetland than a FACU plant. Each category is assigned a numerical value, ranging from -5 for OBL, to 0 for FAC, to +5 for UPL. These values were used to determine the mean Coefficient of Wetness (W) and the percent of the wetland covered by hydrophytic vegetation.

Performance Standard 5

Relative Importance Value of Native Plants

A baseline was established along the long axis near U.S. 34 bearing 75° east of north. The first transect was set approximately 25 m (82 ft) east-northeast of a large silver maple in the southwestern corner of the site, bearing 25° west of north. This transect begins at photo station 1 (marked by a permanent metal stake). Transects were set 30 m (98 ft) apart along the baseline; there were seven transects. Transect length and the number of 0.25 m^2 quadrats per transect were variable because of the shape of the mitigation site. Quadrats were set 25 m (82 ft) apart along the transects. The approximate location of the baseline and transects is indicated on the aerial photo and plan sheet. A total of 39 quadrats were sampled. The aerial cover (indicated by cover class) of each species in the quadrats was recorded using the categories listed in Table 1. Percent cover of plant species was analyzed using cover class mid-points (Table 1).

Sampling and analysis methods are based on standard vegetation sampling procedures (Smith 1980, Cox 1985). Plant species frequency values were determined by dividing the number of plots (quadrats in which an individual species occurred) by the total number of plots sampled (42). Relative importance values for individual species and for combined native (RIVn) and combined non-native (RIVa) were calculated by dividing the sum of relative coverage and relative frequency by two and multiplying by 100: [(RC + RF)/2 *100] = RIV.

Table 1. Cover classes used for quadrat sampling

Cover class	Range of Cover (%)	Midpoint of Range (%)
1	1-5	3.0
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

Photography Stations

As indicated and identified in the three previous monitoring reports (Cooprider et al. 1999, Cooprider et al. 2000, Wilm et al. 2002), seven photo stations were established along the perimeter of the wetland mitigation site to document changes in plant community over time. Photographs are contained in Appendix E.

Results

Performance Standard 1

a) Predominance of Hydrophytic Vegetation

Dominant plant species for the wetland are shown in Table 2. All of the dominant plant species are obligate wetland species and, therefore, are hydrophytic.

Table 2. Dominant plant species by stratum and wetland indicator status, August, 2001.

Species	Strata	Wetland Indicator Status
Typha angustifolia	herb	OBL
Eleocharis acicularis	herb	OBL
Eleocharis erythropoda	herb	OBL
Potamogeton nodosus	herb	OBL

b) Occurrence of Hydric Soils

In the fall of 1994, the wetland portions of the site had saturated soils within 0.3 m (12 in) of the surface (Plocher et al. 1995). In the 1999 monitoring season, all soils in the excavated area were determined to be hydric; this was verified in 2000, 2001, and now again in 2002. Because the soils were excavated, assumptions were made about the characteristics of the former topsoil. Based on landscape position, morphological characteristics in the lower profile, the Soil Survey of Henderson County (USDA 1956), and soils data from the mitigation site assessment (Plocher et al. 1995), the Sawmill series (Cumulic Endoaquoll) was present. The mollic epipedon appears to have been removed. An iron depleted matrix is at the surface and contains many redoximorphic concentrations (Table 3). Standing water and saturated soils in a significant portion of the site were also observed.

Table 3. Soil profile description for excavated wetland compensation area, August, 2001.

Depth (in)	Matrix Color	Concentrations	Depletions	Texture	Structure
0 – 6	2.5YR 4/1	7.5YR 4/6 & 3/4	2.5Y 4/1 fm	Clay	Massive
6 – 15	2.5YR 4/1 & 7.5YR 4/6			Sandy Clay	Massive
15 – 20	2.5YR 4/1	10YR 3.5/6		Sandy Clay	Massive
20 – 26	10YR 4/1			Clay Sand	Massive

c) Presence of Wetland Hydrology

This site is located in the greater Mississippi River floodplain. Although the site may only flood occasionally, the site is affected directly by the Mississippi through water table fluctuations. Field evidence of wetland hydrology included water scouring, wetland drainage patterns, depressional (excavated) landscape, and inundation. Similar to 2001, an estimated one-quarter to one-third of the site was inundated at the time of the survey in 2002.

In 2002, the total area of the created wetland that conclusively satisfied the wetland hydrology criteria was 3.1 ha (7.8 acres) (Fucciolo et al. 2002). The estimated areal extent of 2002 wetland hydrology is shown in Appendix A. 2002 data shows a very slight decrease in wetland hydrology as compared to 2001, but a strong increase over the previous two years. In 2001, 3.4 ha (8.4 acres) satisfied the wetland hydrology criterion (Fucciolo et al. 2001), as compared to 2.75 ha (6.8 acres) in 2000 (Fucciolo et al. 2000) and 2.8 ha (6.9 acres) in 1999 (Fucciolo et al. 1999).

Additional information regarding the presence of hydrophytic vegetation, hydric soils, and wetland hydrology can be found in the Wetland Determination Form (Appendix B).

Performance Standards 2, 3, 6, 8, and 9

Plant Community Quality and Composition

The performance standard indicates that the goal for the Mean Coefficient of Conservatism (C) is 3.5 (after 5 years). This was not met in 2002 or in any of the three previous monitoring years. The mean C value, including planted species was 3.23, excluding them, 3.05, and excluding only planted trees, 3.12. Although not yet meeting the performance standard, mean C did increase from the previous year.

By the end of the fifth year of monitoring, the FQI is required to be twenty or greater. In 2002, the FQI, including all planted species, was 27.01, without these species 23.63, without only the planted trees 25.53. All of these values met the performance standard and were increases from the previous year's sampling results.

In 2002, the three most dominant plant species (ranked by descending relative importance value) were *Typha angustifolia*, *Eleocharis acicularis,* and *Eleocharis erythropoda.* This was a change from the previous two years, with *Eleocharis erythropoda* replacing *Echinochloa muricata* (barnyard grass) as one of the three most dominant species. *Eleocharis acicularis* and *Eleocharis erythropoda* are both highly-desirable, native, obligate wetland species. Narrowleaf cattail (*Typha angustifolia*) is generally considered an aggressive exotic in Illinois.

Of the four dominant plant species (Table 2), at least two are "graminoid" (*Eleocharis acicularis* and *Eleocharis erythropoda*), although definitely not "tall graminoids", as specified in stated project performance standards. Although considered an exotic, the most dominant species, narrowleaf cattail, might also be considered a "tall graminoid". Apparently the term "graminoid" is not truly a scientific term, but, instead, is a general term applying to grasses and grass-like plants. In any case, besides the "graminoid" species already discussed here, only two others have a relative importance value over 2.0, *Leersia oryzoides* and *Eleocharis obtusa* (Appendix C).

Excluding planted tree species, woody vegetation accounted for only a very small portion of the wetland plant community. Cottonwood (*Populus deltoides*) was the most prevalent woody plant species, but had a relative importance value of only 1.14 (Appendix C). The only other woody plant species to be sampled were silver maple (*Acer saccharinum*) and black willow (*Salix nigra*), both with relative importance values less than one. Other woody species observed, but not sampled included: buttonbush (*Cephalanthus occidentalis*), rough-leaved dogwood (*Cornus drummondii*), green ash (*Fraxinus pennsylvanica*), peach-leaved willow (*Salix amygdaloides*), and sandbar willow (*S. exigua*) (Appendix D).

Planted Tree Seedling Survival

Only three species of planted trees were observed during 2002 monitoring (Table 4). Pecan (*Carya illinoensis*), swamp white oak (*Quercus bicolor*), and pin oak (*Quercus palustris*) were all commonly sampled, but no shellbark hickory (*Carya laciniosa*) were recorded. It seems likely that no shellbark hickory were ever planted. In 2000, Cooprider reported finding three shellbark hickory seedlings, but questioned their identification (Coorider et al. 2000).

The majority of sampled tree seedlings appeared healthy and vigorous, with a good chance at long term survival. In 2002, more tree seedlings were counted than in 2001, 831 compared to 764. This can be explained by the difficulty in finding planted trees. In 2002, trees were counted earlier in the year (5 June), in an attempt to get an accurate count before surrounding vegetation grew to obscure the presence of the still small trees. Excluding shellbark hickory, average survival for all planted tree species was 55.4%. Although fairly good, survival was substantially lower than the 75% required in the performance standards set forth for this project. This survival rate also excludes the 500 shellbark hickory seedlings that were apparently never planted. Pecans showed a marked decrease in survival from 2001, approximately half of their previous value.

Table 4. Observed survival rates of planted tree seedlings, June, 2002.

Tree Species	Number Planted (reportedly)	Number Observed Alive	Survival Rate (%)
Carya illinoensis	500	56	11.2
Carya laciniosa	500	0	0.0
Quercus bicolor	500	390	78.0
Quercus palustris	500	385	77.0
Overall	2000	831	41.6
Overall (excluding *Carya laciniosa*)	1500	831	55.4

Performance Standards 4 and 7

Characterization and Extent of Hydrophytic Vegetation

The mean Coefficient of Wetness (mean W) for the entire excavated area was strongly negative, markedly more so than in 2001 (Appendix D). Overall, it was –3.3 when including all planted species, -3.2 when excluding all planted species, and –3.3 when excluding planted tree species. Mean W for native species only was –3.5 when including all planted species, -3.4 when excluding all planted species, and –3.5 when excluding planted tree species.

Similar to 2001, hydrophytic vegetation appeared to dominate throughout the entire excavated area. All quadrats sampled in 2002 contained dominant hydrophytic vegetation. The periphery of the area tended to contain more species typical of non-wetland habitats (e.g., *Solidago canadensis, Cassia fasiculata, Ambrosia artemisiifolia, Aster pilosus, Erigeron* spp., *Setaria faberi*), but nonetheless, this fringe area was still dominated by hydrophytes. Although the vegetation of this fringe area was more mixed than the interior portion of the site, vegetation typical of marsh habitat still tended to dominate, especially *Eleocharis* spp. Based on these sampling results, the entire excavated area could be considered to be marsh.

The interspersion of water and vegetation was again very favorable in 2002. Areas of shallow open water, interspersed with vegetation were very common. Up to one third of the area was covered by shallow water up to several inches in depth. Species such as *Eleocharis acicularis, Eleodea canadensis, Nymphaea odorata, Potamogeton pectinatus,* and *Potamogeton nodosus* were common in these inundated areas, along with emergents such as *Typha, Scirpus, Sagittaria latifolia, Sparganium eurycarpum, Acorus calamus,* and *Alisma plantago-aquatica.*

Performance Standard 5

Relative Importance Value of Native Plants

The relative importance value of native plants (RIVn) in 2002 was 79.29 (Appendix C), a significant decrease from 89.97 in 2001 (Wilm et al. 2002). This decrease was the result of a substantial increase in narrowleaf cattail, whose relative importance value increased from 9.13 in 2001 to 19.35, making it the most "important" plant species overall in 2002. Besides narrowleaf cattail, only one other exotic, non-native species was sampled (*Setaria glauca*) and only four others observed. Reed canary grass *(Phalaris arundinacea*), an exotic species problematic in many Illinois wetlands, was only observed and did not even appear in the quantitative sampling. Exotic, non-native species had a total relative importance value of only 19.71 (of which 19.35 was accounted for by narrowleaf cattail alone). By contrast, excluding planted species, 60 species native to Illinois were recorded, of which 45 were both native and perennial (Appendix D). Only 17 annual species were observed.

Summary and Recommendations

Monitoring results from 2002 indicate that this wetland compensation site is continuing to make progress in its development towards a quality wetland community, although a significant increase in the dominance of narrowleaf cattail is a serious concern. Presently, the site meets three of the nine Performance Standards (3, 4, and 7) completely. The FQI for the site exceeded twenty (the performance standard), both when including (27.01) and excluding (23.63) planted species and it showed an increase from 2001. The native, mean Coefficient of Wetness (W) was strongly negative (as required in the performance standard). Native mean W was –3.5 when including all planted species, -3.4 when excluding all planted species, and –3.5 when excluding planted tree species. Hydrophytic vegetation appeared to dominate throughout the entire excavated area, as all sampled quadrats contained dominant hydrophytic vegetation. Interspersion of water and vegetation was very favorable, with areas of shallow open water, interspersed with vegetation common over much of the area.

Performance Standard 1 (satisfying the three wetland criteria for jurisdictional wetlands) is met for the majority of the site. Dominant hydrophytic vegetation and hydric soils are present across the entire excavated area, although according to the ISGS (Fucciolo et al. 2002) wetland hydrology is present for only 3.1 ha (7.8 acres). This area of wetland hydrology is a slight decrease from 2001 (Wilm et al. 2002).

The goal of a mean Coefficient of Conservatism (C) of 3.5 or greater (Performance Standard 2) has not yet been met. The mean C for the site, including planted species, was 3.23, excluding them, 3.05, and excluding only planted trees, 3.12. Although not yet meeting the performance standard, mean C did increase from the previous year. Mean C in 2001 was 3.04 when including all planted species, only 2.63 when excluding them (Wilm et al. 2002).

As stipulated in Performance Standard 5, the relative importance value of native plants (RIVn) must increase in each successive year. This did not occur in 2002, where RIVn decreased from the previous year. RIVn in 2002 was 79.29, a significant decrease from 89.97 in 2001 (Wilm et al. 2002). This decrease was the result of a significant increase in narrowleaf cattail, whose relative importance value increased from 9.13 in 2001 to 19.35, making it the most "important" plant species overall in 2002.

In 2002, the three most dominant plant species (ranked by descending relative importance value) were *Typha angustifolia*, *Eleocharis acicularis*, and *Eleocharis erythropoda*. The

prevalence of narrowleaf cattail as the most dominant species conflicts with Performance Standard 6. Narrowleaf cattail is an aggressive, weedy exotic that tends to dominate wetlands, often to the point of excluding many desirable native plant species.

As specified in Performance Standard 8, tall graminoid plant species must dominate the created wetland, with woody vegetation remaining a minor component (<30% aerial cover). Based on 2002 sampling results, woody vegetation met the performance standard, with cottonwood having the highest relative importance value at only 1.14. In general however, tall graminoids do not dominate the area. Although narrowleaf cattail may or may not be considered a graminoid species, it is definitely undesirable. Two other graminoid species are among the dominant plants (*Eleocharis acicularis* and *E. erythropoda*), although they would be definitely not be considered "tall".

With regard to survival of planted tree seedlings, sampling results clearly do not meet those set forth in Performance Standard 9. First of all, it appears that the 500 shellbark hickory seedling that were supposed to be planted, never were. Even when excluding these trees, average survival for all planted trees was only 55.4%, well under the 75% required. Two tree species (*Quercus bicolor* and *Q. palustris*) did have survival rates over 75%, although the third species (*Carya illinoensis*) had very low survival (11.2%).

To summarize, monitoring results in 2002 appear generally similar to the previous year. The site continues to develop into quality wetland habitat, but is not without its problems. Foremost of these problems is the prevalence of narrowleaf cattail (*Typha angustifolia*). Although very closely related to and commonly hybridizing with the native common cattail (*Typha latifolia*), narrowleaf is designated an exotic in Illinois. Considered very similar ecologically, narrowleaf cattail is generally regarded to be even more aggressive and weedy than common cattail. In the future, however, it may be useless or impossible to consider these species separately, given their degree of hybridization. This hybridization is only expected to increase over time, when a hybrid cattail complex will cover most of Illinois. Much of the cattail already identified in Illinois as narrowleaf is, no doubt, the hybrid. At this point, however, narrowleaf cattail is still considered separately from common cattail. Furthermore, it is considered an aggressive, weedy, undesirable exotic. The prevalence and dominance of this species directly contributes to the failure to meet three of the performance standards (2, 5, & 6), and possibly a third (Performance Standard 8), depending on whether or not cattail is to be considered a "graminoid". Narrowleaf cattail increased significantly from 2001 to become the most "important" species in the entire wetland, indicating that control measures will likely be needed. Although the wetland compensation area is far from a narrowleaf cattail monoculture, appearing, in contrast, to be a fairly diverse marsh, several performance standards will likely never be met without lessening the impact of this species.

In addition to possible cattail control, if Performance Standards 2 and 8 are to be met, additional planting of tall, native, perennial, graminoid hydrophytes may be necessary. Numerous species of this type are already present (e.g., *Juncus* spp., *Carex* spp., *Leersia oryzoides, Panicum virgatum, Scirupus fluviatilis, Scirupus tabernaemontanii*), but additional plantings might also be necessary to boost the mean Coefficient of Conservatism and establish dominance by "tall, graminoid" plant species, in addition to strengthening and stabilizing the FQI. Species such as *Spartina pectinata, Scirpus americanus, Scirpus cyperinus, Scirpus acutus,* and *Carex lacustris* would all be highly desirable.

Performance Standard 1 (satisfying the three wetland criteria for jurisdictional wetlands for at least 4.1 ha) may not be able to be met. It appears that without further excavation (which is likely impractical), the acreage of wetland desired will not be achieved. Based on ISGS information (Fucciolo et al. 2002), wetland hydrology is present for only 3.1 ha of the 4.1 required. The portion of the site demonstrating wetland hydrology actually decreased slightly

from the previous year (Wilm et al. 2001). It should be noted that the design of the site (excavation within a 10 acre site) precludes the possibility of achieving the desired wetland acreage. Only 8 acres were apparently excavated. Even if the compensation site never achieves the total wetland acreage desired, the majority of the site apparently will be maintained as jurisdictional wetland.

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Appendix A. Estimated areal extent of 2002 wetland hydrology (Fucciolo et al. 2002).

FAP 313 (U.S. 34) Wetland Compensation Site
(based on data collected between September 1, 2001 and September 1, 2002)
(map based on USGS digital orthophotograph, Burlington NW quarter quadrangle)

Figure prepared by ISGS

- ISGS monitoring well
- ISGS benchmark
- Rain gauge
- RDS level logger

100 m
0
300 ft

N

estimated areal extent of 2002 wetland hydrology

estimated areal extent of IDOT excavation

Appendix B. Routine wetland determination form, July 2002.

Routine On-site Wetland Determination
Excavated Wetland Compensation Area
(page 1 of 2)

Field Investigators: Wilm, Kurylo, Feist, Tessene **Date:** July 30, 2002
Contract Number: 88516 **Project Name:** FAP 313 (U.S. 34)
State: Illinois **County:** Henderson **Applicant:** IDOT District 4
Site Name: Marsh (Excavated Wetland Compensation Area)
Legal Description: NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W.
Location: Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

Do normal environmental conditions exist at this site? Yes: X No:
Have the vegetation, soils and/or hydrology been significantly disturbed? Yes: No: X

VEGETATION

Dominant Plant Species	**Indicator Status**	**Stratum**
Typha angustifolia	OBL	herb
Eleocharis acicularis	OBL	herb
Eleocharis erythropoda	OBL	herb
Potamogeton nodosus	OBL	herb

Percentage of plant species that are OBL, FACW, FAC+, or FAC: 100%
Hydrophytic vegetation? Yes: X No:
Rationale: More than 50% of the dominants are OBL, FACW, FAC+ or FAC. In fact all dominant species are OBL.

SOILS
Series and phase: Sawmill silty clay loam (Cumulic Endoaquoll)
On Henderson County hydric soils list? Yes: No: Undetermined: X
Is the soil a histosol? Yes: No: X
Histic epipedon present? Yes: No: X
Redox concentrations: Yes: X No: Color: 7.5YR 4/6 & 3/4
Redox depletions: Yes: X No: Color: 2.5Y 4/1 fm
Matrix color: 2.5YR 4/1 over a mixture of of 2.5YR 4/1 and 7.5YR 4/6
Other indicators: The site is an excavated depression in the floodplain of the Mississippi River. Surface saturation and inundation were also observed.
Hydric soils? Yes: X No:
Rationale: The soils in this area are hydric. This is evidenced by a low chroma matrix and redoximorphic features. This soil also meets the F3 hydric soil indicator from NRCS.

Routine On-site Wetland Determination
Excavated Wetland Compensation Area
(page 2 of 2)

Field Investigators: Wilm, Kurylo, Feist, Tessene **Date:** July 30, 2002
Contract Number: 88516 **Project Name:** FAP 313 (U.S. 34)
State: Illinois **County:** Henderson **Applicant:** IDOT District 4
Site Name: Marsh (Excavated Wetland Compensation Area)
Legal Description: NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W.
Location: Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

HYDROLOGY

Inundated? Yes: X (partially) No: Depth of standing water: Up to 0.46 m (18 in)
Depth to saturated soil: Surface to 0.6 m (24 in)
Overview of hydrological flow through the system: This site is located in an excavated area that is affected by the Mississippi River via water table fluctuations and occasional flooding. Additional hydrologic inputs include precipitation and sheet flow from higher ground. Evapotranspiration, soil infiltration, and possible ground water recharge are hydrologic outputs.
Size of watershed: Approximately 259,000 km^2 (100,000 mi^2) (estimated from 119,000 mi^2 drainage area at Keokuk, IA) (LaTour et al. 1995)
Other field evidence observed: Standing water, surface scouring, wetland drainage patterns, and presence of algal mats.

Wetland hydrology? Yes: X No:
Rationale: Observation of inundation, location in an excavated area, and field indicators of wetland hydrology suggest that this site is inundated for a significant duration during the growing season.

DETERMINATION AND RATIONALE

Is this site a wetland? Yes: X No:
Rationale for decision: This site has hydrophytic vegetation, hydric soils, and wetland hydrology.

Determined by: Brian Wilm, Paul Tessene and Mary Ann Feist
(vegetation and hydrology)
Jesse Kurylo (soils and hydrology)
Illinois Natural History Survey
Center for Wildlife Ecology
607 East Peabody Drive
Champaign, Illinois 61820
(217) 244-2176 (Wilm)

Appendix C. Vegetation sampling results for FAP 313 (U.S. 34) mitigation wetland (n=42), Henderson County, IL, July 30, 2002.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
*Typha angustifolia**[P]	1272.0	30.29	22.42	0.83	16.28	19.35
Eleocharis acicularis[P]	1334.5	31.77	23.52	0.62	12.09	17.81
Eleocharis erythropoda[P]	849.5	20.23	14.97	0.50	9.77	12.37
Potamogeton nodosus[P]	366.0	8.71	6.45	0.29	5.58	6.02
Leersia oryzoides[P]	175.0	4.17	3.08	0.26	5.12	4.10
Alisma plantago-aquatica[P]	160.5	3.82	2.83	0.26	5.12	3.97
Bidens cernua[A]	186.0	4.43	3.28	0.19	3.72	3.50
Ludwigia alternifolia[P]	87.0	2.07	1.53	0.21	4.19	2.86
Eleocharis obtusa[A]	138.0	3.29	2.43	0.17	3.26	2.84
Bidens aristosa[A]	133.0	3.17	2.34	0.12	2.33	2.34
Solidago gigantea[P]	130.5	3.11	2.30	0.12	2.33	2.32
Solidago canadensis[P]	120.0	2.86	2.12	0.12	2.33	2.22
Lindernia dubia[A]	76.5	1.82	1.35	0.14	2.79	2.07
Sagittaria latifolia[P]	46.5	1.11	0.82	0.10	1.86	1.34
Aster pilosus[P]	24.0	0.57	0.42	0.10	1.86	1.14
Populus deltoides[P]	24.0	0.57	0.42	0.10	1.86	1.14
Rotala ramosior[A]	43.5	1.04	0.77	0.07	1.40	1.08
Polygonum sp.	33.0	0.79	0.58	0.07	1.40	0.99
Penthorum sedoides[P]	52.5	1.25	0.93	0.05	0.93	0.93
Salix nigra[P]	52.5	1.25	0.93	0.05	0.93	0.93
Scirpus tabernaemontanii[P]	52.5	1.25	0.93	0.05	0.93	0.93
Carex normalis[P]	21.0	0.50	0.37	0.07	1.40	0.88
Acer saccharinum[P]	9.0	0.21	0.16	0.07	1.40	0.78
Nymphaea odorata[P]	62.5	1.49	1.10	0.02	0.47	0.78
Scirpus fluviatilis[P]	30.0	0.71	0.53	0.05	0.93	0.73
Typha latifolia[P]	30.0	0.71	0.53	0.05	0.93	0.73

*Indicates species not native to Illinois.
A – Annual
P – Perennial
(Table continues on following page.)

Appendix C. Continued.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
Ambrosia artemisiifolia[A]	18.0	0.43	0.32	0.05	0.93	0.62
Cassia fasciulata[A]	18.0	0.43	0.32	0.05	0.93	0.62
Cyperus aristatus[A]	18.0	0.43	0.32	0.05	0.93	0.62
Potamogeton pectinatus[P]	37.5	0.89	0.66	0.02	0.47	0.56
Salix exigua[P]	6.0	0.14	0.11	0.05	0.93	0.52
Bidens tripartita[A]	15.0	0.36	0.26	0.02	0.47	0.36
Cyperus sp.	15.0	0.29	0.26	0.02	0.47	0.36
*Setaria glauca**[A]	15.0	0.36	0.26	0.02	0.47	0.36
Ammania coccinea[A]	3.0	0.06	0.05	0.02	0.47	0.26
Aster simplex[P]	3.0	0.07	0.05	0.02	0.47	0.26
Carex festucacea[P]	3.0	0.07	0.05	0.02	0.47	0.26
Cyperus esculentus[P]	3.0	0.07	0.05	0.02	0.47	0.26
Eupatorium serotinum[P]	3.0	0.07	0.05	0.02	0.47	0.26
Lemna minor[A]	3.0	0.07	0.05	0.02	0.47	0.26
Lycopus americanus[P]	3.0	0.07	0.05	0.02	0.47	0.26
Native Species	4353.0	103.64	76.71	4.18	81.95	79.29
Non-native Species	1287.0	30.64	22.68	0.85	16.75	19.71
Perennial Species	4958.0	118.05	87.38	4.09	80.06	83.71
Native Perennial Species	3686.0	87.76	64.96	3.26	63.78	64.36
Annual Species	667.0	15.88	11.75	0.92	18.17	14.93
All Species	5673.0	135.07	99.97	5.10	100.10	99.99

*Indicates species not native to Illinois.
A – Annual
P - Perennial

Appendix D. Plant species list for FAP 313 (U.S. 34) mitigation wetland, Henderson County, Illinois, July 30, 2002.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Acer saccharinum	silver maple	shrub, herb	FACW	-3	1	P
Acorus calamus	sweetflag	herb	OBL	-5	4	P
Alisma plantago-aquatica	broad-leaf water-plantain	herb	OBL	-5	2	P
Ambrosia artemisiifolia	common ragweed	herb	FACU	3	0	A
Ammannia coccinea	long-leaved ammannia	herb	OBL	-5	5	A
Apocynum sibiricum	Indian hemp	herb	FAC+	-1	2	P
Asclepias incarnata	swamp milkweed	herb	OBL	-5	4	P
Aster pilosus	hairy aster	herb	FACU+	2	0	P
Aster simplex	panicled aster	herb	FACW	-3	3	P
Bidens aristosa	swamp marigold	herb	FACW	-3	1	A
Bidens cernua	nodding beggar-ticks	herb	OBL	-5	2	A
Bidens tripartita	beggartick	herb	OBL	-5	2	A
Carex spp.	sedges	herb	-----	--	--	--
Carex normalis	sedge	herb	FACW	-3	4	P
Carex festucacea	sedge	herb	FAC	0	6	P
Carex frankii	sedge	herb	OBL	-5	4	P
Carex vulpinoidea	fox sedge	herb	OBL	-5	3	P
Carya illinoensis	pecan	shrub	FACW	-3	6 (planted)	P
Cassia fasciculata	golden cassia	herb	FACU-	4	1	A
Cephalanthus occidentalis	buttonbush	shrub, herb	OBL	-5	4	P
Cornus drummondii	rough-leaved dogwood	shrub, herb	FAC	0	2	P
Cyperus aristatus	bearded flatsedge	herb	OBL	-5	2	A
Cyperus esculentus	chufa	herb	FACW	-3	0	P

*Species not native to Illinois

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Cyperus sp.	flatsedge	herb	-----	--	--	--
Cyperus strigosus	straw colored flatsedge	herb	FACW	-3	0	P
Echinochloa muricata	barnyard grass	herb	OBL	-5	0	A
Eleocharis acicularis	needle spike rush	herb	OBL	-5	3	P
Eleocharis compressa	flat-stemmed spike rush	herb	OBL	-5	7	P
Eleocharis erythropoda	spikerush	herb	OBL	-5	3	P
Eleocharis macrostachya	spikerush	herb	OBL	-5	5	P
Eleocharis obtusa	spikerush	herb	OBL	-5	2	A
Elodea canadensis	anacharis	herb	OBL	-5	5 (planted)	P
Erigeron annuus	annual fleabane	herb	FAC-	1	1	B**
Erigeron strigosus	daisy fleabane	herb	FAC-	1	2	P
Eupatorium serotinum	late boneset	herb	FAC+	-1	1	P
Fraxinus pennsylvanica	green ash	shrub, herb	FACW	-3	2	P
Hordeum jubatum	fox-tail barley	herb	FAC+	-1	*	P
Hypericum mutilum	dwarf St. Johns-wort	herb	FACW	-3	5	P
Iris shrevei	southern blue flag	herb	OBL	-5	5 (planted)	P
Juncus effusus solutus	common rush	herb	OBL	-5	4	P
Juncus torreyi	Torrey rush	herb	FACW	-3	3	P
Leersia oryzoides	rice cutgrass	herb	OBL	-5	3	P
Lemna minor	common duckweed	herb	OBL	-5	3	A
Leptochloa sp.	sprangle top	herb	-----	--	--	--
Lindernia dubia	false pimpernel	herb	OBL	-5	5	A

*Species not native to Illinois

**Biennial

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Ludwigia alternifolia	seedbox	herb	OBL	-5	5	P
Ludwigia palustris americana	marsh purslane	herb	OBL	-5	4	P
Lycopus americanus	common water horehound	herb	OBL	-5	3	P
Lythrum alatum	winged loosestrife	herb	OBL	-5	5	P
Mimulus ringens	monkey flower	herb	OBL	-5	5	P
Nymphaea odorata	fragrant water lily	herb	OBL	-5	6 (planted)	P
Panicum capillare	witch grass	herb	FAC	0	0	A
Panicum virgatum	prairie switchgrass	herb	FAC+	-1	4	P
Penthorum sedoides	ditch stonecrop	herb	OBL	-5	2	P
Phalaris arundinacea	reed canary grass	herb	FACW+	-4	*	P
Polygonum amphibium	water smartweed	herb	OBL	-5	3	P
Polygonum punctatum	dotted smartweed	herb	OBL	-5	3	A
Polygonum sp.	smartweed	herb	-----	--	--	--
Pontederia cordata	pickerelweed	herb	OBL	-5	8 (planted)	P
Populus deltoides	eastern cottonwood	shrub, herb	FAC+	-1	2	P
Potamogeton nodosus	American pondweed	herb	OBL	-5	7 (planted)	P
Potamogeton pectinatus	comb pondweed	herb	OBL	-5	5	P
Quercus bicolor	swamp white oak	shrub	FACW+	-4	7 (planted)	P
Quercus palustris	pin oak	shrub, herb	FACW	-3	4 (planted)	P
Rotala ramosior	tooth-cup	herb	OBL	-5	4	A
Rumex crispus	curly dock	herb	FAC+	-1	*	P
Sagittaria latifolia	arrowhead	herb	OBL	-5	4 (planted)	P
Salix amygdaloides	peach-leaved willow	shrub, herb	FACW	-3	4	P

*Species not native to Illinois

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Salix exigua	sandbar willow	shrub, herb	OBL	-5	1	P
Salix nigra	black willow	shrub, herb	OBL	-5	3	P
Scirpus fluviatilis	river bulrush	herb	OBL	-5	3	P
Scirpus tabernaemontanii	great bulrush	herb	OBL	-5	4 (planted)	P
Setaria faberi	giant foxtail	herb	FACU+	2	*	A
Setaria glauca	pigeon grass	herb	FAC	0	*	A
Solidago canadensis	Canada goldenrod	herb	FACU	3	1	P
Solidago gigantea	late goldenrod	herb	FACW	-3	3	P
Sparganium eurycarpum	burreed	herb	OBL	-5	5	P
Typha angustifolia	narrow-leaved cattail	herb	OBL	-5	*	P
Typha latifolia	cattail	herb	OBL	-5	1	P
Verbena hastata	blue vervain	herb	FACW+	-4	3	P

*Species not native to Illinois

Number of hydrophytic species (including all planted species) – 68 (88.3%)

Number of hydrophytic species (excluding all planted species) – 58 (86.6%)

Number of hydrophytic species (excluding planted tree species) – 65 (87.8%)

Number of species native to Illinois (including all planted species) – 70 (90.9%)

Number of species native to Illinois (excluding all planted species) – 60 (89.6%)

Number of species native to Illinois (excluding planted tree species) – 67 (90.5%)

FQI (including all planted species) = $R/\sqrt{N} = 226/\sqrt{70} = 27.01$

FQI (excluding all planted species) = $R/\sqrt{N} = 183/\sqrt{60} = 23.63$

FQI (excluding planted tree species) = $R/\sqrt{N} = 209/\sqrt{67} = 25.53$

(Summary information continues on the following page.)

Appendix D. Continued.

Mean Coefficient of Conservatism (C) (including all planted species) = R/N = 226/70 = 3.23
Mean Coefficient of Conservatism (C) (excluding all planted species) = R/N = 183/60 = 3.05
Mean Coefficient of Conservatism (C) (excluding planted tree species) = R/N = 209/67 = 3.12
Mean Coefficient of Wetness (including all planted species) = -254/76 = -3.3
Mean Coefficient of Wetness (excluding all planted species) = -209/66 = -3.2
Mean Coefficient of Wetness (excluding planted tree species) = -244/73= -3.3
Mean Coefficient of Wetness for native species (including all planted species) = -247/70 = -3.5
Mean Coefficient of Wetness for native species (excluding all planted species) = -202/60= -3.4
Mean Coefficient of Wetness for native species (excluding planted tree species) = -237/67 = -3.5
Number of perennial species (including all planted species) – 59 (76.6%)
Number of perennial species (excluding all planted species) – 49 (73.1%)
Number of perennial species (excluding planted tree species) – 56 (75.7%)
Number of perennial species native to Illinois (including all planted species) – 55 (71.4%)
Number of perennial species native to Illinois (excluding all planted species) – 45 (67.2%)
Number of perennial species native to Illinois (excluding planted tree species) – 52 (70.3%)
Number of annual species – 17 (22.1%)

Appendix E. Photographs from permanent photograph stations.

Figure 1. Photo station 1, N/NW

Figure 2. Photo station 2, N/NW

Figure 3. Photo station 3, N/NW

Figure 4. Photo station 4, W/SW

Figure 5. Photo station 5, W/SW

Figure 6. Photo station 6, N/NW

Figure 7. Photo station 7, N/NW